Topic: Price of the product

Question: An item is currently selling for $\$50$/unit. The quantity supplied is decreasing by 10 units/week. What is the rate at which the price of the item is changing?

$$q = 4{,}000e^{-0.01p}$$

Answer choices:

A $\$2.43$ per week

B $\$1.86$ per week

C $\$6.59$ per week

D $\$0.41$ per week

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Solution: D

To solve for the rate of change of the price of the item over time dp/dt, you'll need to use the formula for quantity, and take its derivative.

$$q = 4{,}000e^{-0.01p}$$

$$\frac{dq}{dt} = -40e^{-0.01p}\frac{dp}{dt}$$

We were given that $p = 50$ and $dq/dt = -10$.

$$-10 = -40e^{-0.01(50)}\frac{dp}{dt}$$

$$-10 = -40e^{-0.50}\frac{dp}{dt}$$

$$\frac{-10}{-40e^{-0.50}} = \frac{dp}{dt}$$

$$\frac{dp}{dt} = \frac{1}{4e^{-0.50}}$$

$$\frac{dp}{dt} = \frac{e^{0.50}}{4}$$

The rate at which the price of the item is changing is $\$0.41$ per week.

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Topic: Price of the product

Question: An item is currently selling for $\$100$/unit. The quantity supplied is decreasing by 20 units/week. What is the rate at which the price of the item is changing?

$$q = 4{,}000e^{-0.01p}$$

Answer choices:

A $\$0.18$ per week

B $\$0.74$ per week

C $\$1.36$ per week

D $\$5.44$ per week

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Solution: C

To solve for the rate of change of the price of the item over time dp/dt, you'll need to use the formula for quantity, and take its derivative.

$$q = 4{,}000e^{-0.01p}$$

$$\frac{dq}{dt} = -40e^{-0.01p}\ \frac{dp}{dt}$$

We were given that $p = 100$ and $dq/dt = -20$.

$$-20 = -40e^{-0.01(100)}\ \frac{dp}{dt}$$

$$-20 = -40e^{-1}\ \frac{dp}{dt}$$

$$\frac{-20}{-40e^{-1}} = \frac{dp}{dt}$$

$$\frac{dp}{dt} = \frac{1}{2e^{-1}}$$

$$\frac{dp}{dt} = \frac{e}{2}$$

The rate at which the price of the item is changing is $\$1.36$ per week.

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Topic: Price of the product

Question: An item is currently selling for $\$150$/unit. The quantity supplied is decreasing by 25 units/week. What is the rate at which the price of the item is changing?

$$q = 4{,}000e^{-0.01p}$$

Answer choices:

A $\$1.03$ per week

B $\$2.80$ per week

C $\$2.64$ per week

D $\$0.97$ per week

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Solution: B

To solve for the rate of change of the price of the item over time dp/dt, you'll need to use the formula for quantity, and take its derivative.

$$q = 4{,}000e^{-0.01p}$$

$$\frac{dq}{dt} = -40e^{-0.01p}\frac{dp}{dt}$$

We were given that $p = 150$ and $dq/dt = -25$.

$$-25 = -40e^{-0.01(150)}\frac{dp}{dt}$$

$$-25 = -40e^{-1.50}\frac{dp}{dt}$$

$$\frac{-25}{-40e^{-1.50}} = \frac{dp}{dt}$$

$$\frac{dp}{dt} = \frac{5}{8e^{-1.50}}$$

$$\frac{dp}{dt} = \frac{5e^{1.50}}{8}$$

The rate at which the price of the item is changing is $\$2.80$ per week.

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